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## Content

*This newsletter describes the content of a new project, which deals with novel ideas in combining real time computer vision with high resolution patch spraying of weeds in maize. The goal is to explore new ways of reducing the consumption of herbicides by at least 50 percent compared to conventional spraying.*



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## Micro patch spraying of weeds in maize

In response to the growing environmental concerns about spray drift, soil surface contamination and the demand for reduction in the usage of chemicals, alternative technologies to conventional weed control in agriculture should be considered

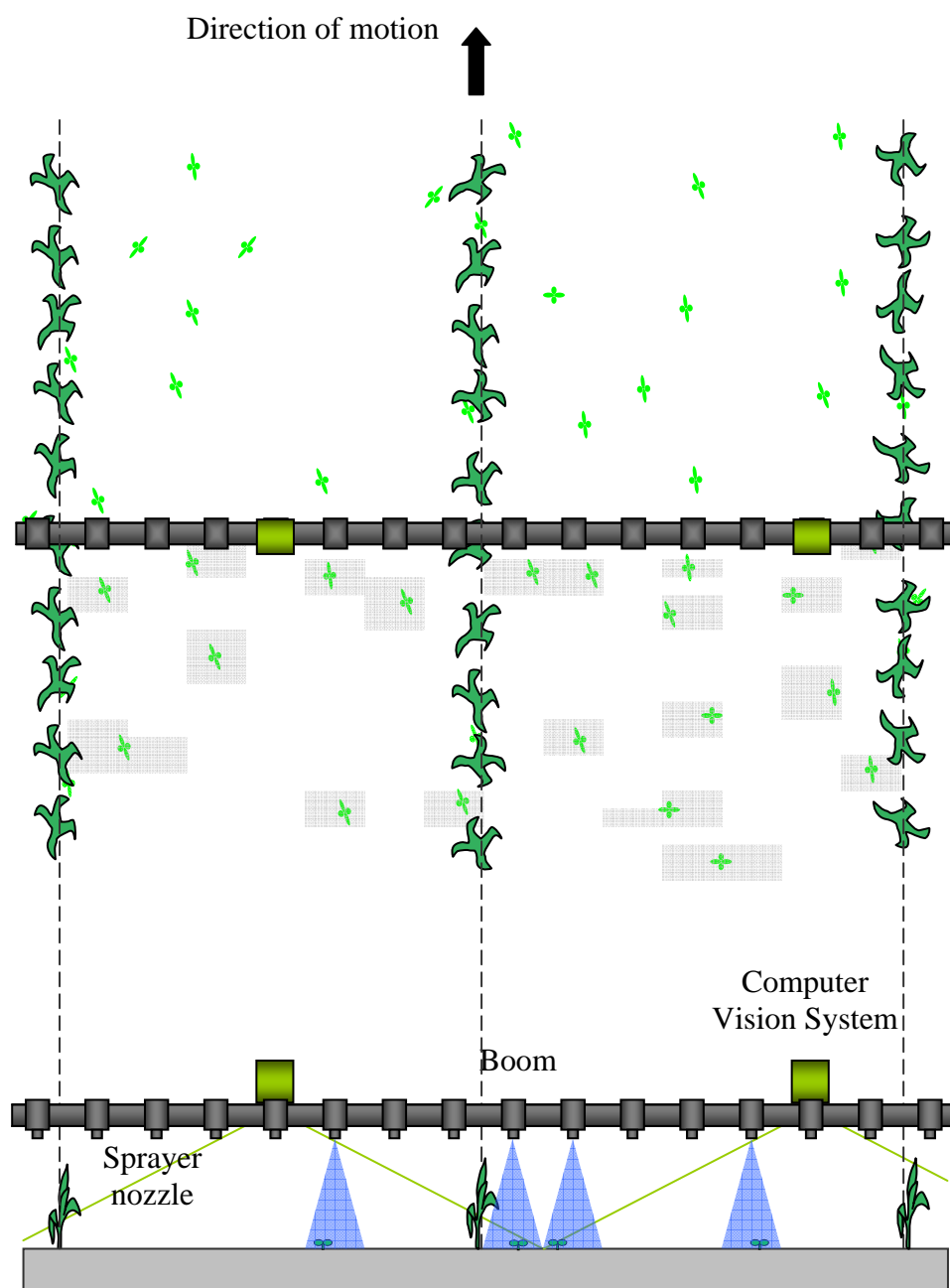
Several research projects have shown the potential reduction of herbicides by spatially adjusted application to the local need for weed control (Christensen et al., 2003). Weed occurrence and density varies significantly, and in theory the largest potential reduction will be achieved with single plant application of the lowest sufficient dose or droplet. However the aim of this project is to demonstrate possibilities of applying herbicides to patches with weed without spraying patches where no weeds are detected.

Application only on patches with weed also reduces soil surface loss. Jensen et. al (2003) have quantified the soil surface loss for broadcast spraying in different arable crops. They measured a soil surface loss of 66% in cereals and up to 99 % in sugar beats.

The hypothesis is that real time, spatially adjusted spraying of patches with weed can be obtained by use of high resolution vision based spray technologies, maintaining the quality in the overall spray work and reducing the environmental impact.

## Method

A high resolution computer vision system is used to identify the weed patches in the field by dividing the whole field into a grid with single cell sizes of approx. 50 cm<sup>2</sup> as shown in the figure. An algorithm is used to set a threshold for the application of herbicide in a single cell. This information is used to control an on/off micro patch sprayer. It means that the sprayed patches with weed will receive the normal field dose, corresponding to a conventional uniform application method, while patches without weed will not be sprayed at all.



**Figure 1. Principle of the micro patch sprayer**

### **Work packages**

The project is organized into 5 work packages, each of which provides important input to the fulfillment of the aim of the project:

- Development of a real time high resolution computer vision system for weed detection and its ability to discriminate between crops and weeds at outdoor conditions
- Micro patch spraying technologies using modified commercial products. The quality of the herbicide application will be documented in terms of the precision

in the spray distribution in the single grid cells and the droplet size, -direction and -volume

- Documentation of the biological efficacy from micro patch-spraying technologies. The investigation will be focused on two main problems, namely spray formation in narrow bands close to the weed plants and spray formation to small patches of weed corresponding to the grid size in the spray map
- Automatic real time data logging of important spray and weather parameters. The parameters can be logged during the spray application and used for traceability studies as well as for documentation of the functionality of the micro patch sprayer
- Evaluation of the use of micro patch spraying technology in conventional agriculture taking into account environmental as well as economical aspects.

### **Participating organizations**

Danish Institute of Agricultural Sciences, Department of Agricultural Engineering  
Danish Institute of Agricultural Sciences, Department of Crop Protection  
Danish Agricultural Advisory Service

### **Financing**

The project is financed by Danish Environmental Protection Agency, Danish Ministry of the Environment

### **References**

Christensen, S., Heisel, T., Walter, A.M. & Graglia, E., 2003. A decision algorithm for patch spraying. *Weed Research* 43(4), 276-284

Jensen, P. K. & Spliid, N. H. 2003. Deposition of pesticides on the soil surface. *Pesticides Research*, 65. Danish Environmental Protection Agency, 59 pp.

### **Topics of coming newsletters**

Navigation systems and IT in Denmark

Portraits of Ph.D. students in the area of agricultural engineering and technology

